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**BROAD AGENCY ANNOUNCEMENT**

**U.S. ARMY RESEARCH INSTITUTE FOR BEHAVIORAL AND SOCIAL SCIENCES'S BASIC RESEARCH PROGRAM.**

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**I. The Basic Research Office (BRO)** of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) solicits new proposals for its fiscal year 2006 contract program of fundamental research in behavioral science. This Broad Agency Announcement is issued per FAR 35.016.

The purpose of the research is to add new, fundamental knowledge to behavioral science sub-disciplines and discover generalizable principles. Novel and state-of-the-art approaches to difficult problems are especially welcome, as are integrated programmatic efforts to develop and test theory. A portion of available funding may be made available for meritorious proposals from minority institutions and historically Black colleges and universities, and these entities are encouraged to participate.

Investigations that focus on purely physiological mechanisms or psychopathology cannot be considered by this agency; however, neuroscience approaches to memory, cognition, and personality are encouraged. Similarly, no consideration can be given to purely applied research projects (e.g., human factors studies or applied training programs). However, support for basic science does depend on the judgment that its research findings will stimulate new, applied behavioral technologies with potential for improving the effectiveness of Army personnel and their units. The decision to fund a new basic research program consists of two stages. In the first stage, each proposal is peer reviewed for responsiveness and technical merit by at least two behavioral scientists. Those proposals that are judged responsive and receive high technical ratings go to the second stage. In stage two, ARI research unit chiefs are asked whether the research generated by a given proposal, if successful, would transition to their applied research programs. Proposals that are highly rated and identified as having transition potential to one or more ARI applied research programs will be given priority for funding. Proposals that are responsive and receive high technical ratings may also be funded but will generally be given a lower priority.

**II. Scientific Problems for Basic Research.**
To meet the transformation objectives of the U.S. Army over the next two decades, the Army must improve its ability to: (1) Select, train, and/or develop leaders and Soldiers who are flexible and adaptable in novel missions and operational situations; (2) Select, train, and/or develop leaders and Soldiers to function effectively in digital, information rich, and semi-autonomous environments; (3) Select, train, and/or develop teams that can function collaboratively and effectively when quickly formed and/or operating in distributed, high stress environments; (4) Accelerate development of leadership skills that usually develop over time only through direct experience; (5) Select, train, and/or develop leader and Soldier interpersonal and intercultural skills/attributes that make leaders and Soldiers effective in joint-service and multi-national operations. These needed improvements form the broad perspective of ARI's research objectives. In keeping with this broad perspective, the areas listed below are of special interest to ARI. It is particularly important that the research proposal clearly describe how its

basic research effort can lead to applied research that would be meaningful to the Army.  Some of our special interest basic research issues are:

A. Basic Research — Cognition
   The Army is interested in basic research on cognitive functioning, particularly as it affects the requirements of the Future Force, as follows:
   1. Understanding the relationship between cognitive pattern recognition, adaptivity, and situation awareness.  Cognitive pattern recognition is viewed as the process by which the brain organizes data/experiences into hypotheses.  Hence, the patterns of interest here are not visual; rather they are conceptual patterns, ideas, or predictions that are synthesized from data and/or experiences.  Several questions need to be answered.  Specifically, what is the relationship, if any, between cognitive pattern recognition and adaptivity (which, by definition, includes effective situation awareness)?  If applicable, what practical measures of pattern recognition can be shown to predict fluid intelligence and/or adaptivity?  The generation and testing of hypotheses may be the primary mechanism for effective situation awareness and adaptivity.  Research to date has focused on the process of hypothesis testing and has avoided the more difficult but potentially fruitful induction processes of hypothesis generation.  If basic research can discover effective processes for identifying individuals with varying cognitive pattern recognition ability or enhancing this ability through training, it could lead to higher levels of situation awareness, adaptive behaviors, and more effective performance on the battlefield.
   2. Understanding the individual differences in cognition that affect the saturation point of information from unmanned systems; especially the question of how many robots/semi-autonomous vehicles one operator can manage.
   3. Identifying and understanding the individual cognitive processes that characterize more effective team performance; a better understanding of the growth of expertise in performing complex tasks.
   4. Identifying and understanding the input-output cues that lead to effective collective skill development.  Determining the cognitive factors that facilitate or impair team formation and contribute to a sense of trust.   Identifying the principles for developing shared mental models that influence understanding of the commander's intent and team performance.  Understanding the effects of a technologically rich, networked digital environment on a leader's ability to make decisions, convey intent, adapt quickly, build teams, and resist stress.

B. Basic Research – Human Resource Practices
   1. General Selection, including: identifying the aptitude and skill requirements that are specific to the Future Force Soldier; assessing how persistence and dependability develop and contribute to effective performance and job tenure, how they relate to job factors, and how individual differences in such processes can be measured; the extent to which practical intelligence is a function of an aptitude that cuts across domains and how to develop a method for measuring this aptitude; how to anticipate change and develop performance measures for Future Force Soldiers for tasks that are not currently known.
   2. Selection specific to the semi-autonomous/robotic/information/communication requirements of the Future Force including:  What characteristics should a Soldier as an operator possess?  How do you select for multi-tasking and decision making ability?

What utility, if any, does flexibility/adaptability to change have for operator selection? What metrics and criteria should be used for selecting and assigning operators?

3. Identifying factors that affect enlistment decision making, including demographics and motivation, and modeling how these factors develop. Identifying factors that influence retention decision making, productive behavior, and good citizenship and modeling how they develop. This research should consider the nature of mediators such as values and ethics, personal motivation, job satisfaction, and organizational commitment in this process.

C. Basic Research—Training and Learning.
1. Training in Complex Situations, including factors that enhance transfer of training of the sort of complex tasks performed by Army personnel; the amount of training and feedback required to established sustainable improvements in complex task performance; the most effective mixes and sequences of training modes (e.g., classroom, live exercises, and simulations) in which complex tasks should be taught; reducing the effects of information overload through training; determining how individuals assign meaning and relevance to large amounts of ambiguous data being rapidly received and determine how to improve this ability through training; improving adaptability through training.
2. Understanding and modeling the role of feedback and feedback systems in the acquisition, retention, and transfer of individual and collective training and in motivating learned task performance.
3. Methods for compressing training time that maximize retention and transfer of training.
4. Training for semi-autonomous/robotic/information/communication systems including: can multi-tasking be trained? If so, how?. What effect, if any, multi-tasking training have on reducing information overload and to what it extent can it be measured and predicted?
5. Interpersonal and Group/Team Training, including the incorporation of mentoring and collaborative learning into web-based or distributed learning where team/group members are not familiar with each other and/or group team members may change unexpectedly; investigating the most effective method of developing interpersonal skills such as communication, negotiation, mediation, emotional intelligence; determining how necessary assessment and feedback is in training interpersonal skills; best approaches to mentoring/coaching and how one can teach unit commanders such approaches.
6. Training and Technology, including assessing and addressing the unique training requirements in digital/information/communication systems; determining the human and training dimensions that affect compliance and/or effectiveness in self-regulated training environments; and understanding and modeling the effectiveness of "just in time" training.

D. Basic Research—Leadership
1. Methods for accelerating leader development to include assessment and training methods, tools, and devices.
2. Methods for assessing and developing/training flexibility and adaptability when faced with novel situations.
3. Assessing the nature of changes, if any, in the leader's role with the introduction of semi-autonomous/robotic/information/communication systems. What characteristics will a

leader need to possess in order to lead a mixed (human and machine) team, and how will they be measured?

4. Identifying methods for describing and explaining implicit models of team and/or leadership processes (e.g., in a multicultural setting) and for assessing the impact of those implicit models on team and/or leader performance.

5. Understanding and measuring shared intent within vertical, hierarchical team structures.

6. Identifying and validating <u>objective</u> measures of leadership performance. The goal of this research is to identify and validate objective performance measures of leadership. It is understood that effective leadership leads to battlefield success, and being able to identify effective leadership traits and develop leadership training would be highly desirable for the Army. All current research in these areas identifies varying levels of leadership performance via secondary data--either through subjective scales or by assuming that more effective unit performance is, by definition, the product of more effective leadership. Primary data--objectively measurable leadership behavior-- has not been identified. This objectively measurable behavior should be the goal of leadership selection and training research. With such data, applied research will have a solid basis for studying causal trait and training relationships leading to leadership behavior. Thus, the goal here is to identify objectively measurable leadership behaviors that lead to more effective leadership. Also, what specific objectively assessed leader behaviors influence team member's perceptions of leader performance and enhance unit performance.

7. Identifying what aspects of leadership, if any, will be affected by the existence of dispersed teams addressing such questions as: What are the leadership skills necessary to effectively lead teams and organizations partially or fully dispersed geographically and/or temporally? What are the mechanisms that communicate and sustain a common understanding of command intent across geographic and temporal boundaries in dispersed teams and organizations?

8. Identifying what leadership skills are necessary to effectively lead and develop multi-team systems. What skills are necessary to effectively participate in multiple teams and roles within a multi-team system? How can overall effectiveness of a multi-team system be optimized? What role does task interdependence play within a multi-team system?

9. Identifying the types of learning or knowledge that are best handled through self-development; the specific training needs the Army has that are best handled through self-development; the strategies or interventions the Army use can to support these and other individual self-development efforts; best approach(es) for self-development (e.g., reflection, web-based training, self-awareness toolkits) including the question of whether it is possible and practical for leaders to self-develop interpersonal skills through distance learning; determining whether self-development has to occur in isolation or also as a social process – as part of a team.

10. Determining the interpersonal skills that are essential for Future Force leaders, how to differentiate these skills from traditional constructs, and what assessment devices can be used or developed to measure them.

11. Developing a better understanding of the relationship between adult learning and growth in leadership ability. Most adult learning research that has focused on young college students who are, at best, immature adults. Additional research is needed to explore the applicability of these principles to mature adults in their 30s and 40s.

E. Basic Research— Social Structures

The Army does not exist in a vacuum. It is a component of the overall societal system and is affected by changes in that system. We wish to support research leading to a better understanding of the military environment, including how major societal conditions and trends, changing Army missions, and Army culture influence recruitment, personnel retention, morale, cohesion, discipline, and military performance. We need to know how to achieve organizational change without severe adverse personnel effects. This research should result in models that consider the role of personal involvement by members at all organizational levels in successfully implementing change. We are especially interested in understanding individual differences in cultural awareness and how such awareness develops

F. Basic Research — Understanding the role of affect (emotions) in calibrating behavioral action and cognition.

The objective of this research is to understand the adaptive value of human emotions in calibrating psychological systems. This is the essence of self-control and self-awareness, both of which are critical to the success of any military operation. Psychological science does not understand well how emotions, as positive and negative evaluative processes, operate together or in opposition to influence actions and cognitions. We need better measures of these affective processes that include functional neuroimaging, changes in brain chemistry, as well as more traditional psychological measures. Understanding how emotions can help people to calibrate their behaviors and thoughts to achieve internal stability in difficult situations is critical to achieving effective performance on the battlefield and in other difficult military operations. We are especially interested in how leaders identify, shape, and channel their own emotions and the emotions of their subordinates to impact individual-level and group-level performance. We are also interested in understanding how people respond emotionally to information from human vs. robotic systems and how this affects the trust they place in those information sources.

G. Basic Research — Understanding the origins and development of social systems and networks.

The objective of this research is to understand how cooperative and altruistic behavior occurs against a backdrop of self-interest to produce effective working groups. Furthermore, we need to understand how group and individual social-psychological processes operate to manage and use information. We need to understand how social networks form and evolve in groups of various sizes. Results from this research area would help groups and leaders adapt their organizations to fit the operational environment and to minimize the effects of attrition in their social networks. Furthermore, it would allow leaders to assess better how to disrupt the social networks of opposing forces.

**III. Time, Personnel, and Other Features of the Research.**

Typical ARI basic research contracts have ranged between one and four years, with a median of three years. The median three-year basic research total contract cost has been $490,000 in recent years. Proposals may be for a complete research effort or formulated as one or more options that will be exercised by ARI if early results are promising. Short-term, small-scale efforts in high-risk/high-gain areas are also welcome. Finally, investigators are encouraged to conduct their basic research in realistic contexts, where appropriate. However, the use of military participants is not encouraged. Both single-investigator and collaborative research efforts are acceptable, as

are multidisciplinary approaches to a central problem. Collaborative efforts may involve researchers at a single institution or in cooperating institutions.

Offerors with questions about the suitability of their planned research may send e-mail or call (less preferred method) the relevant in-house research unit chief(s). However, use of e-mail is optional and not a secure method of communication. For help in locating the appropriate research unit chief(s), contact either of the BRO program managers listed at the end of this BAA. Again, e-mail is the preferred contact medium. The government is not responsible for technical difficulties or disclosures resulting from e-mail communications.

*Proposals from PI's Early in Career.* As part of the Army Research Institute's effort to support innovative and creative research, a new category of proposals also is being solicited. Proposals are requested from individuals who have never received ARI funding in the past and preferably who are early in their research careers. These proposals will be evaluated separately from all others. All typical ARI evaluation dimensions will be used for this category or proposals except the dimension that deals with the experience of the principal investigator. In this case, qualifications, capabilities, institutional resources and facilities will still be included, but experience of the proposed principal investigator will require that (a) the proposed PI has never been funded by ARI, and (b) the proposed PI is within the five years of being awarded his/her final degree.

In all other respects the materials in this BAA apply equally to both traditional sources of proposals and to this new category. Guidelines for the new category of proposals are:

1. When the proposal is submitted, investigators must specify that they are requesting consideration under this category of funding.
2. Research projects should be designed for one year of funding, with the possibility of optional years (one to two additional years) should the initial work prove promising.
3. Behavioral and social science proposals are welcome, but the research must fit into one of the stated BAA areas of interest.
4. Investigators should be early in their research careers (less than five years post-doctorate) and cannot have received funding from ARI in the past.
5. While there is no specific amount of funding set aside for these proposals, initial budgets should be modest.
6. In any given year, proposals may or may not be funded as a function of the quality and creativity of the submitted proposals.

**IV. Application Procedures.**
Proposals are to be e-mailed to **BRO@ari.army.mil** in electronic MS Word.doc format. If proposals are funded, two signed hardcopies will be sent at ARI's request. If the electronic version includes a signature from the appropriate representative of the university or company, hard copies will not be needed. The proposal MS Word file must include the complete technical and financial sections of the proposal.
Proposals must include an abstract and be sufficiently detailed to be responsive to the criteria, described below, for evaluation. You must include e-mail addresses and telephone numbers where technical and contracting questions can be addressed. The formal proposal must include

institutional endorsement, signature of the proposed principal investigator, time frames for all phases of the project, and detailed accounts of proposed work and budget. The background and technical sections of the formal proposal must be no greater than 25 pages in length, single-spaced. Additional materials may include budget, vitae, references, and institutional information. One copy must be submitted by e-mail.

Scientific peers will review the proposals according to the following dimensions in order of importance: (1) Importance of the research to ARI's mission and Army concerns. (2) Technical merit, appropriateness, and feasibility of the proposed approach. (3) Scientific significance of the issue and originality. (4) The qualifications, capabilities, and experience of the proposed principal investigator and key personnel, and institutional resources and facilities. This final dimension will be altered for those early career proposals described above. In this case, qualifications, capabilities, institutional resources and facilities will still be included, but experience of the proposed principal investigator will require that (a) the proposed PI has never been funded by ARI, and (b) the proposed PI is within the five years of being awarded of the final degree. This final dimension will function as a filter on such early career proposals.

Each dimension will be given a letter grade between A and F. Those proposals with very low importance to ARI and the Army will be unable to recover even with high grades on other dimensions. Technical merit is significantly more important than dimensions 3 or 4 (except for dimension 4 in the case of early career proposals). Scientific significance is somewhat more important than qualifications. Moreover, successful proposals must propose costs that are both affordable and realistic for the proposed effort. The evaluation of proposed cost is subordinate to the technical evaluation. Also, past performance, prior research, and research and development contracts to include timely completion and cost effectiveness will be considered.

The following material applies to both traditional and the above described new category of proposals. All research proposals should contain the following sections: Abstract, Background, Technical Approach, References, Resumes of proposed researchers, and Budget.

*Abstract*. The abstract should be one page or less. It should describe the problem underlying the research, the hypothesis being tested, explain the objective of the proposal, and provide a condensed, but meaningful description of the technical approach. It is very important that in the abstract and in the body of the proposal, the author makes quite clear how this basic research, if successful, could lead to applied research in areas dealt with by ARI. In the case that the author wishes to apply as an early career proposal, investigators must specify that they are requesting consideration under this category of funding in the abstract.

*Background*. The background should include a description of the problem, as the proposal author understands it. It is helpful if the author shows an understanding of the Army and ARI contexts that apply to the proposed research. The description of the problem should be tied to an account of significant previous and current research that is applicable. Clearly, there will not be enough space to write a critical, annotated bibliography, but the author should demonstrate meaningful knowledge of the background of the research that is being proposed.

*Technical Approach*. This is a critical part of the proposal and it should be responsive to the listed criteria. It should include a description of the hypothesis upon which the research is to be based, the goal of that research, and a detailed account of how the research is to be done. This account should be much like the methods section of a research paper. It should include a description of the data to be collected, the methods for collecting the data, the number and source of subjects and how they will be acquired, and the proposed research design and likely analysis methods. It is possible that an intermediate or final product of research might include training packages, simulation models, or other software-based devices. In this case, the author should show how such a product relates to the hypothesis being tested and should provide sufficient detail to permit understanding and evaluation.  The technical approach should include a statement that details the major tasks to be performed and products to be produced.  In the case of a one-year proposal, the statement should be divided by quarters of the year.  In the case of multi-year proposals, it should be divided by year.

*Reference List*. This should be a list of all the references called out in the body of the proposal. It should not include publications that are not referred to in the body.  The references list must be in American Psychological Association format, APA 5$^{th}$ Edition.

*Résumés*. Résumés or vitae should be included for all proposed researchers with special emphasis on the Principal Investigator(s). It is particularly important that resumes include publications that bear on the research being proposed.   Authors submitting  an early career proposal  should specify that they are requesting consideration under this category as a note in their vitae

*Budget*. This should be a typical budget section as is required by other federal agencies. However, it should also include a description of total dollars required overall, per government fiscal year (the government fiscal years run from October 1 through the following September 30), and the number of person hours/months per government fiscal year broken out by personnel type (senior scientist, graduate student, research associate, clerk, etc.).
Proposers who are not in the Washington, DC area should budget at least one trip per year to ARI in Arlington, VA to present the progress of their research.  Proposers who are in the Washington, DC area should budget this trip to Kansas City, Missouri.

**V. Concept papers.**
ARI invites potential offerors who would like an early indication of the suitability of their topics to submit concept papers by e-mail to **BRO@ari.army.mil.**  Concept papers are optional.  If submitted, they must be in the form of an MS Word DOC, be five single-spaced pages or less, concisely address the proposed research, and should contain only an approximate total budget projection. Please enclose an e-mail address and a telephone number where you can be reached. Please submit concept papers **at least 6 weeks before** the deadline for proposals. Concept papers submitted later than this may not receive a timely response.

**VI. Deadlines.** To be considered for funding, electronic versions of the formal proposals (in for form of a single MS Word Doc file) must be received at ARI by e-mail no later than **3:30 P.M. EDST 1 June 2005.**  Electronic versions of the technical and cost proposals must be combined into one M.S. Word DOC file.  This file must be e-mailed to the e-mail address provided below.

Following the evaluation process, authors of those proposals that have been selected for the contracting process will be informed.  At that time, a signed original and one copy of the complete proposal (technical and cost) should be FEDEXed to ARI at:

U.S. Army Research Institute
Basic Research Office
ATTN: Paul Gade
2530 Jefferson Davis Highway
Arlington, VA 22202-3926

Awards will be made between October 1, 2005 and September 30, 2006.  Inquiries and concept papers may be sent to the following address or by e-mail.

Where to e-mail:  Concept papers and the single M.S. Word DOC file containing both technical and cost proposals must be e-mailed to:  **BRO@ari.army.mil.**